Guidelines for Flapless Surgery

Anthony G. Sclar, DMD*

With the introduction of in-office cone beam computed tomography (CT), improved access to conventional CT scanning, and dental implant treatment planning software allowing on-the-spot 3-dimensional evaluations of potential implant sites, the use of “flapless” implant surgery has gained popularity among surgeons. Although the flapless approach was initially suggested for and embraced by novice implant surgeons, the successful use of this approach often requires advanced clinical experience and surgical judgment. This article reviews the advantages and disadvantages of and indications and contraindications for flapless dental implant surgery, with special emphasis on requirements for establishing or maintaining long-term health and stability of the peri-implant soft tissues. Prerequisites for surgeons wishing to use the flapless tissue punch approach in dental implant surgery are outlined and put into perspective relative to conventional open-flap surgery techniques and other minimally invasive procedures currently used in implant surgery. Procedures for single- and multiple-tooth applications are illustrated.

© 2007 American Association of Oral and Maxillofacial Surgeons


Some of the earliest applications of the “flapless” approach in dental implant surgery involved innovative site preservation techniques developed for immediate or delayed implant placement after tooth extraction in areas of high esthetic concern. The rationale for the flapless approach in these case scenarios was to isolate the implant and/or grafted socket from the oral cavity obtaining an inclusive guided bone regeneration effect while preserving circulation and esthetic soft tissue contours.1 This was a radical departure from the then strongly supported concept of isolating implants placed into fresh extraction sockets with a barrier membrane and primary flap closure.2 In addition, mounting clinical experience demonstrated that esthetic hard tissue contours were also maintained by using minimally traumatic extraction techniques and substitution bone graft materials. This approach yielded predictable results even in the most challenging case scenarios with multiple contiguous implants placed in areas of high esthetic concern (Fig 1).

With the introduction of in-office cone beam computed tomography (CT), improved access to conventional CT scanning, and new dental implant treatment planning software allowing 3-dimensional evaluation of potential implant sites, the use of flapless surgery for implant placement has been gaining popularity among implant surgeons. In its simplest form, flapless surgery involves using a tissue punch device to gain access to the alveolar ridge for implant placement or abutment connection (Fig 2). Although the flapless approach was initially suggested for and embraced by novice implant surgeons, the successful use of this approach often requires advanced clinical experience and surgical judgment.

Although flapless implant surgery has numerous advantages, including preservation of circulation, soft tissue architecture, and hard tissue volume at the site; decreased surgical time; improved patient comfort; and accelerated recuperation, allowing the patient to resume normal oral hygiene procedures immediately after, the approach does have some drawbacks. Some of these include the surgeon’s inability to visualize anatomic landmarks and vital structures, the potential for thermal damage secondary to reduced access for external irrigation during osteotomy preparation, the increased risk of malposed angle or depth of implant placement, a decreased ability to contour osseous topography when needed to facilitate restorative procedures and to optimize soft tissue contours, and, most importantly, the surgeon’s inability to manipulate soft tissues to ensure circumferential adaptation of adequate dimensions of keratinized gingival tissues around emerging implant structures.

As such, there are certain prerequisites for surgeons wishing to use the flapless approach for im-

*Director of Clinical Research and Postgraduate Dental Implant Surgery, Department of Oral and Maxillofacial Surgery, College of Dental Medicine, Nova Southeastern University, Fort Lauderdale-Davie, FL.

Address correspondence and reprint requests to Dr. Sclar: South Florida OMS, 7600 Red Road, Suite 101, Miami, FL 33143; e-mail: anthony.sclar@aol.com

© 2007 American Association of Oral and Maxillofacial Surgeons

0278-2391/07/xxDx-0532.00/0
doi:10.1016/j.joms.2007.03.017
FIGURE 1. Replacement of failing maxillary incisors with multiple adjacent implants using a flapless approach. A and B, Preoperative radiographs demonstrating maxillary incisors with unfavorable root morphology and moderate horizontal bone loss. C, Three adjacent 1-piece nonsubmerged implants (Straumann USA, Andover, MA) were placed with the Bio-Col ridge preservation technique immediately after flapless tooth removal facilitated by the use of periotomes. D and E, Postoperative radiographs documenting ideal placement of 3 adjacent implants and the lack of sufficient surgical and restorative dimension to allow placement of a fourth implant. (Figure 1 continued on next page.)

plant placement and uncovering procedures. These include in-depth knowledge of the criteria for optimal flap designs used in dental implant surgery, as well as the clinical goals for surgical management of peri-implant soft tissues. The surgeon should also be knowledgeable regarding the indications and techniques (soft tissue surgical maneuvers) commonly required for successful management of peri-implant soft tissues during conventional open flap surgery. Finally, the surgeon should be familiar with other available minimally invasive techniques that incorporate abbreviated incisions and flaps, as well as pouch and tunnel dissections, because these approaches may be more beneficial than the flapless tissue punch approach in many clinical scenarios.

A firm grasp of the information just outlined, combined with clinical experience, will allow the implant surgeon to put flapless surgery in proper perspective relative to conventional open-flap surgery and other minimally invasive approaches. To begin with, the surgeon should be familiar with the following criteria for optimal flap designs used in dental implant surgery: (1) preserve circulation and alveolar ridge topography; (2) provide access for required

FIGURE 1 (cont’d). F, Three-month postoperative view showing that the flapless approach combined with the early tissue molding provided by Esthetic Plus abutments (Straumann USA, Andover, MA) resulted in preservation of esthetic soft tissue volume and contours. The implant sites are ready for provisional restoration. G, One year postdelivery of final restoration (18 months postimplant placement) demonstrates that under specific circumstances, multiple adjacent implants can be successfully used in areas of high esthetic concern.

The implant surgeon also must be familiar with the clinical goals and guidelines for surgical management of peri-implant soft tissues. The clinical goal of this surgical management is to establish an adequate zone, approximately 3.0 mm in apicocoronal dimension (width), of attached nonmobile, preferably keratinized, soft tissue that is circumferentially adapted to the transmucosal implant structures. Although Brånemark et al originally advocated using vestibular incisions, buccal flaps initiated with pericrestal incisions have been shown to provide a practical and effective approach to implant placement, abutment connection, and ancillary grafting procedures. Typically, the buccal flap is outlined by a pericrestal incision and 1 or more vertical releasing incisions located at the mesial and distal extent of the site. The surgeon simply adjusts the position and bevel of the pericrestal incision to accommodate for submerged or nonsubmerged implant placement and abutment connection procedures.

FIGURE 2. Tissue punch devices for flapless implant surgery. Hand-held punch (Uni-Punch; Premier Medical, King of Prussia, PA) and rotary tissue punch (Salvin Dental Specialties, Charlotte, NC) devices are available in multiple diameters corresponding to commonly available implant diameters.

abutment connection to a submerged implant, optimal flap design dictates locating the pericrestal incision such that approximately 3.0 mm of good-quality keratinized tissue remains on the oral aspect of the emerging implant structures. Then the apicocoronal dimension (width) of the keratinized gingival remaining on the elevated buccal flap guides the surgeon in selecting the appropriate surgical maneuver for that particular site, keeping in mind the need to obtain a circumferential adaptation of approximately 3.0 mm of keratinized tissue surrounding the emerging implant (Table 1).

Resective contouring (gingivectomy) is indicated when the apicocoronal dimension of keratinized gingival remaining on the buccal flap adjacent to the implant site is 5 to 6 mm (Fig 3). Typically, the surgeon begins by passively aligning the flap adjacent to implant abutment at one end of the surgical site and uses a low-profile scalpel (eg, a 15c blade) to perform the resection. The flap is then secured mesial and distal to that abutment with interrupted sutures. Next the surgeon evaluates the width of tissue at the adjacent sites and, if indicated, sequentially performs the resective contouring maneuver at each site and secures the flap to obtain circumferential tissue adaptation around the remaining abutments (Figs 3B,C).

The papilla regeneration technique, as originally described by Palacci,⁶ is indicated when 4 to 5 mm of keratinized tissue remains on the buccal flap margin adjacent to the implant site in question. This technique is very useful for obtaining circumferential closure of good-quality tissue around the emerging implant.

**Table 1. GUIDELINES FOR SELECTING SOFT TISSUE SURGICAL MANEUVERS**

<table>
<thead>
<tr>
<th>Width of Keratinized Gingiva Present on Buccal Flap Margin</th>
<th>Indicated Surgical Maneuver</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 6 mm</td>
<td>Resective contouring</td>
</tr>
<tr>
<td>4 to 5 mm</td>
<td>Papilla regeneration (Palacci)</td>
</tr>
<tr>
<td>3 to 4 mm</td>
<td>Lateral flap advancement</td>
</tr>
</tbody>
</table>


![FIGURE 3. Resective contouring. A, When apicocoronal dimension of keratinized tissue remaining on the buccal flap is between 5 and 6 mm, the resective contouring maneuver is used to obtain circumferential tissue closure around the emerging implant neck or abutment. After outlining the flap, tissue is taken from the top of the ridge and moved in a buccal direction. B, A 15c scalpel is used to precisely perform the gingivectomy adjacent to the emerging implant neck, after which the tissue is adapted around the abutment and, if appropriate, the resection is repeated sequentially adjacent to each implant site. C, The contoured flap is then apically repositioned and secured around each emerging implant with sutures placed in the interimplant areas. (Reprinted with permission.)](image-url)
plant structures (Fig 4A). The use of this technique also promotes the formation of an interimplant papilla when adequate bone support is present and ideal spacing between implants has been achieved. In a fashion similar to the resection maneuver, the surgeon passively aligns the flap adjacent to the implant abutment and places light pressure near the flap margin with his or her finger tip after, then uses a low-profile blade to create a pedicle in the margin of the flap in such a fashion to allow passive rotation into the adjacent interdental or interimplant space (Fig 4B). The flap is then secured with interrupted sutures, typically resulting in exposure of alveolar bone distal or mesial to the site. Closure at the areas of bone exposure is obtained through mucosal advancement, or, in some cases, a protective dressing is applied in this area (Fig 5C). In Kennedy class III situations, the flap is extended through split-thickness dissection to allow advancement of a portion of the keratinized tissue present around the adjacent natural dentition into the implant site without encroaching on the marginal gingival tissues. Preoperative assessment allows the surgeon to determine whether sufficient apicocoronal dimension of keratinized tissue is present around the adjacent dentition to allow for this.

When the apicocoronal dimension of keratinized tissue surrounding an implant restoration is or will be <3.0 mm, the surgeon should consider using soft tissue augmentation procedures to provide for long-term stability. The propensity for progressive peri-implant soft tissue recession is multiplied when inadequate tissue thickness is combined with reduced keratinized tissue width at a particular site.
Along with having in-depth knowledge of the clinical goals, guidelines, and surgical techniques used for successful management of peri-implant soft tissues, the implant surgeon also should be familiar with other minimally invasive approaches for implant placement, exposure, and grafting, such as U-shaped peninsula flaps (Fig 6), abbreviated trapezoidal flaps, and pouch or tunnel dissections, which can have advantages comparable to those of the flapless tissue punch approach with improved access and visualization (Figs 7 and 8). Furthermore, the surgeon should consider using instrumentation that minimizes tissue trauma and helps preserve soft tissue volume, which is in concert with the underlying concept of minimally invasive surgery. High-frequency (4 MHz) radio surgery instrumentation allows the implant surgeon to maintain a relatively "bloodless" field during minimally invasive procedures, thus maximizing intraoperative visibility (Fig 9). This provides a significant intraoperative for surgeons performing implant surgery and adjunctive procedures through the minimally invasive approaches described earlier. In addition, this technology allows the surgeon to perform very fine incisions in precise locations with negligible lateral tissue damage, resulting in maximum tissue preservation at the site.7

Finally, armed with the necessary prerequisites outlined earlier, the surgeon can take full advantage of the flapless approach in dental implant surgery. The flapless (tissue punch) approach is indicated when the surgeon has confidence that the underlying osseous anatomy is ideal relative to the planned implant diameter and 3-dimensional placement in the alveolus. Typically, this is determined by clinical and radiographic evaluation, aided by analysis of articulated dental study models. Nevertheless, interactive CT treatment planning is of great benefit for evaluating osseous ridge morphology in a significant percentage of cases. In cases where site preservation is performed at the time of tooth removal, the surgeon should closely observe and document the dimensions of the remaining alveolar housing and the morphol-
ogy of any socket wall defects. This information will allow the surgeon to decide whether a flapless approach will be feasible for subsequent implant placement in most cases when delayed implant placement is planned after the tooth extraction.

Most importantly, as outlined earlier, the surgeon also must be able to determine whether an adequate volume of good-quality soft tissues will remain surrounding the emerging implant structures for optimal function and esthetics. To minimize soft tissue complications that can jeopardize the long-term success of an implant restoration, the quantity, quality, and position of the existing keratinized tissues relative to the planned implant emergence should be evaluated before surgery. This evaluation is facilitated by a preoperative try-in of the surgical template, allowing the surgeon to determine whether adequate apicocoronal width of keratinized tissue will remain after a tissue punch procedure to establish a stable peri-implant soft tissue environment, as discussed earlier. To make this determination, the implant surgeon must be familiar with the criteria for optimal flap designs used for implant placement and exposure as outlined earlier (Fig 10). When these criteria are not met, the flapless approach is contraindicated (Fig 11). Finally, when unexpected intraoperative findings necessitate additional access or visualization, the surgeon must be prepared for the appropriate course of action (Fig 12).

References

FIGURE 7. Abbreviated flap-pouch procedure. A, An abbreviated flap is outlined by incisions that are beveled toward the center of the site that end at the mucogingival junction. B, After subperiosteal elevation of the abbreviated flap, surgical access and visualization is enhanced by extending the dissection further apically (pouch dissection), allowing a guided bone regeneration procedure to be performed to repair a fenestration defect. C, The beveled portions of the flap are precisely readapted and simple interrupted sutures are used for closure at both lateral incisor sites. D, By combining an abbreviated flap with a subperiosteal pouch, an ideal esthetic result was obtained. This minimally invasive approach provided access for performing the guided bone regeneration procedure without extensive flap elevation that can result in flap retraction and soft tissue shrinkage. The papillary sparing beveled incisions resulted in inconspicuous incision lines and maintenance of scalloped soft tissue architecture.

FIGURE 8.

GUIDELINES FOR FLAPLESS SURGERY

FIGURE 8.
FIGURE 8. Use of minimally invasive procedures for esthetic implant replacement of fractured central incisor and repair of associated labial bone and soft tissue recession defects. (Reprinted with permission.)

A, Preoperative frontal view demonstrated tissue inflammation and discoloration resulting from tooth fracture and tooth mobility. Soft tissue shrinkage is expected after tooth removal despite use of ridge preservation. B, Preoperative radiograph demonstrating widened periodontal ligament space and apical radiolucency. C, Types of abial bone defect after tooth removal. Whereas labial bone defects whose widths are 1/3 the width of the site or less have a favorable prognosis of regeneration when site preservation procedures are performed, those wider than 1/3 of the width of the site have an unfavorable prognosis despite site preservation. The defect in this case had a favorable morphology. D, A pouch procedure was used to dissect in a subperiosteal plane extending 2.0 mm beyond the periphery of the defect. An absorbable collagen membrane (Bio-Gide; Osteohealth, Oceanside, NY) was carefully positioned within the pouch after which Bio-Oss anorganic bovine bone mineral was condensed in the extraction socket. This creates a “tenting” effect of the periosteum overlying the labial bone defect. The membrane was folded over the occlusal portion of the porous bovine mineral graft and an absorbable collagen dressing (CollaPlug; Zimmer Dental, Carlsbad, CA) was placed to further isolate the site, support the supraperiosteal soft tissues, and to promote rapid connective tissue growth and epithelialization of the site. Iso-butyl cyanoacrylate tissue cement (IsoDent; Ellman International, Oceanside, NY) was then placed over the collagen dressing to render the site impervious to oral liquids. E, The postextraction site preservation radiograph. F, Four months after tooth removal, flapless implant placement was facilitated using a rotary tissue punch. Sharp dissection was used to create a supraperiosteal pouch, which served as a recipient site for a subepithelial connective tissue graft harvested from the maxillary tuberosity. G and H, Smile and close-up frontal views of the implant restoration 18 months after delivery of the final restoration. Flapless tooth extraction and delayed implant placement combined with minimally invasive pouch approaches for repair of the favorable labial bone defect and subsequent soft tissue reconstruction yielded an excellent esthetic result in this case of high esthetic concern.

FIGURE 9. Application of 4-MHz radio surgery in minimally invasive dental implant surgery. The 4-MHz radio surgery technology (Surgitron; Ellman International, Oceanside, NY) allows the surgeon to perform incisions with minimal heat dissipation and cellular alteration. Very fine incisions can be precisely located adjacent to implant abutments without the risk of unanticipated soft tissue recession. The relatively bloodless surgical field achieved using this instrumentation provides a tremendous advantage for surgeons performing minimally invasive dental implant surgery.

FIGURE 10. Application of the flapless approach for implant replacement of a failing mandibular molar. A, Preoperative radiograph of a failing mandibular molar. The patient had experienced continued sensitivity after completing endodontic therapy over a 2-year period. Note the radiolucency in the interradicular area indicating a chronic inflammatory process most likely associated with bacterial ingress. B, Three months postextraction with site preservation with the Bio-Col technique, the location and apicocoronal dimension of keratinized tissue at the site is ideal for placement of the implant through a flapless approach. C, One week post-flapless implant placement. Peri-implant tissue health is ideal, and the papillary and col anatomy have been preserved. Note that adequate apicocoronal dimension of keratinized tissue surround the implant despite the tissue punch procedure. Accelerated healing and improved postoperative oral hygiene are evident. D and E, Clinical and radiographic views 1 year postdelivery of the final restoration. The flapless approach for tooth extraction, site preservation, and subsequent implant placement preserved the hard and soft tissue ridge contours facilitating the delivery of an implant restoration that is functional, self-cleansing, and esthetically pleasing. Note the complete resolution of preexisting radiolucency and maintenance of ideal crestal bone levels.

FIGURE 11. Determining whether flapless surgery is indicated for implant placement. A, Preoperative try-in of surgical template indicated that the flapless approach was contraindicated at the first molar implant site. Nevertheless, during surgery, a round bur was used to mark the center of the implant osteotomy by penetrating through the soft tissues at the ridge crest before elevation of the abbreviated flap seen here. The location of the soft tissue puncture clearly demonstrates that the use of a 6.0-mm tissue punch would have excised all the keratinized tissue buccal to the emerging first molar implant. Note that a tissue punch approach would have been feasible for the second molar site. B, In this case, ideal tissue thickness allowed the use of a variation of the papilla regeneration maneuver. The pedicles were created in the lingual flap and passively rotated into the interimplant space. C, A simple interrupted suture was used to secure the abbreviated buccal flap mesial and distal to the emerging first molar implant and a horizontal mattress suture was used to secure the lingual pedicles in the inter-implant space without embarrassing their circulation. Note the 6.0-mm margin of apicocoronal keratinized tissue present on the buccal flap adjacent to the second molar implant. D, Resective contouring was performed at the second molar site with a 15c blade, and a simple interrupted suture was used to secure the flap distal to the second molar implant. E, Three-year follow-up clinical photograph demonstrating a stable and self-cleansing peri-implant soft tissues environment as a result of appropriate flap design and use of surgical maneuvers to create scalloped soft tissue contours that resist collection of food debris.

FIGURE 12. Use of minimally invasive tunnel dissection to provide access for repair an osseous fenestration defect occurring unexpectedly during flapless implant placement. A, Occlusal view of flapless placement of implant (Prevail; 3i Biomet, Palm Beach Gardens, FL) after use of a rotary tissue punch and a series of twist and profile drills. Unexpectedly, a fenestration defect was detected by palpation over the apical aspect of the surgical site. B and C, A full-thickness vertical incision was performed 5.0 mm mesial to the fenestration defect and a subperiosteal tunnel was made 5.0 mm distal to the defect. Grafting was accomplished through this minimally invasive approach using autogenous bone and porous bone mineral (Bio-Oss; Osteohealth, Shirley, NY). The resorbable barrier membrane (Ossix Plus; 3i Biomet) shown in this photograph was introduced into the tunnel and stabilized by absorbing blood at the site with light pressure held over the graft site for 10 minutes. Interrupted sutures were then used for closure. D, Postoperative periapical radiograph demonstrates ideal implant positions as per surgical guide. Seating of abutments through the tissue punch access is facilitated by the integrated platform-switching feature of the implants used in this case (Prevail; 3i Biomet). E, Postoperative cone beam CT cross-sectional image (i-Cat Vision Software; Imaging Sciences International, Hatfield, PA) of the grafted defect indicating successful augmentation of the defect and surrounding thin buccal plate visualized through the subperiosteal tunnel.